

U.S. Application 09/845,856

PATENT  
Docket No. 2001B036**REMARKS**

Applicants respectfully request entry of this Amendment and reconsideration of this application, as amended.

**Summary of Status of Amendments and Office Actions**

Claims 1 and 6 presently stand allowed as amended by the Examiner. Claims 2 through 5 and 7 through 10 presently stand canceled.

The Examiner has amended the claims 1 and 6 to read as follows:

1. A process for producing cumene comprising the step of contacting benzene with propylene under alkylation conditions in the presence of an alkylation catalyst comprising between about 0.05 and about 0.5 wt.% phosphorus and a MCM-56 zeolite, said conditions being sufficient to produce cumene.

6. The process of claim 1, wherein the alkylation conditions are such as to maintain benzene substantially in the liquid phase.

The Examiner has further cancelled claims 2 and 7 through 10. Applicants previously cancelled claims 3 through 5 without prejudice.

**Response to Examiner's Amendment**

Applicants respectfully decline to accept the Examiner's Amendment for the reasons articulated below.

With respect to claim 1, the Examiner has stated that U.S. Patent No. 5,536,894 to Degnan et al. discloses "alkylation of an aromatic such as benzene with an olefin such as propylene to produce cumene in the presence of a MCM-56 catalyst (the abstract; col. 10, lines 38-45). Degnan discloses that the catalyst may contain phosphorous and its benefits (col. 14, lines 7-11)." The Examiner further notes that Degnan et al. only mention the amount of

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phosphorous contained in the catalyst in Example 15 which discloses a catalyst containing 2.2 wt.% of phosphorous. The Examiner then goes on to note that "one having ordinary skill in the art who studies the teaching of Degnan and examples 5-9 and table 3 of this application must recognize that applicants of this application are the first who discover the benefit of using a catalyst having 0.05 to 0.5 wt.% of phosphorous as called for in claim 1."

Applicants wish to amend claim 1 to delete the limitation of 0.05 to 0.5 wt.% of phosphorous. Applicants respectfully note that the catalyst of Example 15 disclosed by Degnan et al. was prepared for use in catalytic cracking with phosphorous added to improve thermal stability under severe reaction conditions. The preparation disclosed further included severe steam treatments to reduce the catalyst's Alpha Value to 3. Phosphorous is known in the art of catalytic cracking as a means for increasing thermal stability of a zeolite. In column 14, lines 7 through 11, Degnan et al. state that phosphorous may be added for "any of the functions generally attributed thereto, such as, for example, attrition resistance, stability, metals passivation, and coke make reduction." It is respectfully noted that the discussion of phosphorous above occurs in the context of the discussion of MCM-56 as a catalytic cracking catalyst (col. 11, line 10 to col. 14, line 63).

Degnan et al. disclose alkylation temperatures of about 10 to about 125°C (column 10, line 42) and catalytic cracking temperatures of about 400 to about 650°C (column 12, line 19). It is respectfully noted that Example 15 of Degnan et al. would not have provided any motivation to one of ordinary skill in the art to apply phosphorous treated MCM-56 in an alkylation process occurring under very different reaction conditions which would not have comparable thermal stability requirements.

#### Prior Rejection of Present Claims Under 35 U.S.C. 102(b)

In order to be fully responsive to prior rejections, Applicants wish to address the rejection of claims 1 through 5 and 7 as being anticipated by Dessau et al. (U.S. Patent No. 5,939,597). The Examiner stated on page 2 of the Office Action dated June 3, 2002 that Dessau et al. disclose "a process of methylation of toluene in the presence of a catalyst containing MCM-22 and phosphorous (the abstract; col. 4, lines 39-45; col. 5, lines 34-36)." Applicants respectfully request withdrawal of this rejection for the following reasons.

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It is respectfully noted that the addition of phosphorous to the catalyst described by Dessau et al. was for the purpose of enhancing the toluene alkylation selectivity for para-xylene (col. 5, lines 14 to 48). Selectivation as described by Dessau et al. functions by blocking surface sites on the catalyst, forcing the reaction to occur within the pore spaces to enhance selectivity for a particular reaction product by controlling the size and shape of reaction products leaving the pore spaces of the catalyst. It would have been counter-intuitive for one of ordinary skill in the art to apply such a selectivation process to MCM-22, since MCM-22 is primarily a surface-active catalyst. Blocking surface sites on MCM-22 would have been expected to reduce catalyst activity rather than enhancing selectivity.

Noting that Dessau et al. did not, therefore, anticipate the present invention as claimed in the initial specification, Applicants respectfully wish to amend claim 1 to remove the restriction on alkylating agents mistakenly introduced in Applicants' response dated August 29, 2002.

The Office Action of June 3, 2002, further rejected claims 1, 2, 7, 8, and 10 as being anticipated by Degnan et al. (U.S. Patent No. 5,536,894). Applicants respectfully request withdrawal of this rejection.

On page 3 of the Office Action dated June 3, 2002, the Examiner noted that Degnan et al. disclose "a process of alkylation of an aromatic such as benzene with ethylene or propylene in the presence of a catalyst containing MCM-56 and phosphorous (the abstract; col. 10, lines 28-67; col. 14, lines 7-11)." As noted above, the addition of phosphorous in Degnan et al. was in the context of catalytic cracking applications rather than alkylation, and such a use of phosphorous was known in the art as a means of increasing thermal stability in high temperature processes such as catalytic cracking.

It is noted that Applicants mistakenly extrapolated the results obtained with given phosphorous concentrations tested in combination with MCM-56 as possibly applying to other catalysts. Examples 2 and 3 and Table 1 in the specification, pages 11 and 12, show results for 0.5 to 5.0 wt.% phosphorous with respect to MCM-22. Determination of the optimal phosphorous levels for any of the catalysts described in claim 1 can be made with minimal experimentation. For this reason, Applicants have amended claim 1 to remove the previously added restrictions with respect to phosphorous concentrations.

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For all of the reasons stated above, Applicants respectfully request the Examiner to reconsider and withdraw the earlier rejections of claims 1 through 5, 7, 8, and 10 under 35 U.S.C. 102(b).

Prior Rejection of Present Claims Under 35 U.S.C. 103(a)

The Examiner stated on page 4 of the Office Action dated June 3, 2002, that claims 3 through 5 and 9 were rejected as being unpatentable over Degnan et al. (U.S. Patent No. 5,536,894) along the lines discussed above. Applicants reiterate, as discussed above, that Degnan et al. did not anticipate or make obvious any application of phosphorous with respect to catalyst use in an alkylation process.

The Examiner also previously rejected claim 6 under 35 USC 103(a) as being unpatentable over U.S. Patent No. 5,536,894 to Degnan et al. along the lines discussed above. The Examiner observed that while Degnan et al. were silent respecting the phase of alkylation employed, U.S. Patent No. 5,557,024 to Cheng et al. discloses alkylation using an MCM-56 catalyst either in the gas or liquid phase. The Examiner argued it would have been obvious to one skilled in the art to have modified the Degnan et al. process by operating a liquid phase alkylation to arrive at Applicants' process because it is expected that alkylation processes operated in the liquid or gas phase yield similar results. Again, the combination of Degnan et al. with Cheng et al. does not make the present invention obvious because this combination does not disclose or make obvious the use of phosphorous with catalysts used for alkylation processes under alkylation conditions.

The combination of Degnan and Cheng fails to disclose or suggest to one skilled in the art the present invention which provides enhanced alkylation activity as shown in Tables 1 and 3 of the specification at pages 12 and 15 respectively. Given this discovery, Applicants respectfully submit that the present claim 6 is patentable over the combined references. Accordingly, withdrawal of this previous rejection is respectfully requested.

With the amendments made herein and in light of the clarifications above, it is respectfully submitted that the claims are in condition to be allowed under 35 U.S.C. § 112.

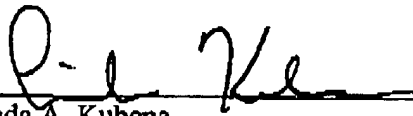
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## CONCLUSION

In view of the foregoing comments, entry of this Amendment and allowance of this application is earnestly solicited.

Respectfully submitted,

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**VERSION WITH MARKINGS TO SHOW CHANGES MADE**  
**IN THE CLAIMS:**

Please amend claims 1 through 10 as follows:

1. [Three Times Amended] A process for producing [cumene] an alkylaromatic compound comprising the step of contacting [benzene] an alkylatable alkylaromatic compound with [propylene] an alkylating agent under alkylation conditions in the presence of an alkylation catalyst comprising [between about 0.05 and about 0.5 wt.%] phosphorus and a [MCM-56 zeolite] porous crystalline inorganic oxide material having an X-ray diffraction pattern including the d-spacing maxima at 12.4±0.25, 6.9±0.15, 3.57±0.07 and 3.42±0.07 Angstrom, said conditions being sufficient to produce [cumene] said alkylaromatic compound.
2. [Reinstated] The process of claim 1, wherein the porous crystalline inorganic oxide material is selected from the group consisting of MCM-22, PSH-3, SSZ-25, MCM-36, MCM-49 and MCM-56.
3. [Reinstated] The process of claim 1, wherein the alkylation catalyst contains between about 0.05 and about 10 wt.% phosphorus, as measured on an elemental basis, based on the weight of the final catalyst.
4. [Reinstated] The process of claim 1, wherein the alkylation catalyst contains between about 0.1 and about 2 wt.% phosphorus, as measured on an elemental basis, based on the weight of the final catalyst.
5. [Reinstated] The process of claim 1, wherein the alkylation catalyst contains between about 0.1 and about 0.5 wt % phosphorus, as measured on an elemental basis, based on the weight of the final catalyst.

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6. [Twice Amended] The process of claim 1, wherein the alkylation conditions are such as to maintain [benzene] the alkylatable aromatic compound substantially in the liquid phase.
7. [Reinstated] The process of claim 1, wherein the alkylating agent includes an aliphatic group having 1 to 5 carbon atoms.
8. [Reinstated] The process of claim 1, wherein the aromatic hydrocarbon is benzene and the alkylating agent is selected from ethylene and propylene.
9. [Reinstated] The process of claim 1, wherein the aromatic hydrocarbon is benzene, the alkylating agent is ethylene and the alkylation catalyst includes phosphorus and MCM-22.
10. [Reinstated] The process of claim 1, wherein the aromatic hydrocarbon is benzene, the alkylating agent is propylene and the alkylation catalyst includes phosphorus and MCM-49 or MCM-56.